NR 445 Technical Advisory Group

Evaluation of Diesel Exhaust Emissions

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Caroline Garber, 608-264-9218
garbec@dnr.state.wi.us
Jeff Myers, 608-266-2879
myersj @dnr.state.wi.us
Andrew Stewart, 608-266-5499
stewaa @dnr.state.wi.us
Bureau of Air Management

Purpose

- To address 3 main issues for the rule revision:
  - Should diesel exhaust particulate be added to NR 445 as a probable carcinogen?
  - If so, should the exemption for diesel fuel combustion in NR 445 be maintained?
  - If not, how should sources of diesel exhaust particulates be regulated?

Summary of Findings

- Diesel exhaust particulate emissions have been identified as a probable carcinogen by both the International Agency for Research on Cancer & the National Toxicology Program
- The number of permits issued for diesel-fueled electric generators continues to grow.
- Distributed generation forecasted to provide up to 20% of all new power generation by 2010 (US Dept. of Energy)

Diesel Generators - Screening Level Analysis

- Reviewed & inventoried existing in-house information on approximately 400 diesel generators.
- Categorized information into nine generator/stack height configurations.
- Using an air dispersion analysis, estimated potential impacts from over 200 diesel-fueled generators considering:
  - highest permitted PM emission rate (based on NAAQS);
  - best/worse meteorological characteristics;
  - highest/lowest unit risk factor indicated in the EPA and CA literature.

Diesel Generators - Screening Level Analysis (cont.)

- Range of cancer risks found in literature:
  - US EPA: 12 in a million to 1200 in a million
  - CARB: 130 in a million to 2400 in a million

- Impact Range from highest permitted source in stacks category :
  - area source (44 sources): 460 to 170,000 in a million
  - stacks 12 to 19 ft (73 sources): 14 to 17,000 in a million
  - stacks 20 to 29 ft (39 sources): 1 to 4,200 in a million

Summary of Findings (cont.)

- Staff analysis showed that the majority of diesel generators permitted under PM/NOx requirements have allowed emission levels with cancer risks that may exceed 1 in 100,000.
- Permitted generators do not have particulate matter control.
- Diesel particulate emissions are not a federal CAA HAP, therefore standards under s. 112 (MACT, residual risk) will not be developed

Conclusions

- Diesel exhaust particulate meets the basis for inclusion as a probable carcinogen in NR 445.
- Other PM and NOx air regulations are not protective of public health from a cancer risk perspective.
- Department currently lacks regulations to require measures to reduce the cancer risk from these sources.
- The current, across the board exemption for combustion of diesel fuel oil is inappropriate in light of the scientific evidence & potential impact to public health from stationary sources.

Recommendations

- Diesel exhaust particulate emissions should be listed in NR 445 as a probable carcinogen.
- Emissions from the combustion of diesel fuel should not be exempt from the control requirements in NR 445.
- Emissions from stationary & portable diesel-fueled engines should be regulated as a source category in NR 445.

Proposal

- Modify exemption for group 1 fossil fuels to exclude combustion of fuel oil in compressed-ignition internal combustion engines.
- Do not set risk-based threshold levels for diesel exhaust particulate.
- Set threshold levels for compressed-ignition engines combusting fuel oil based on a combination of stack height & annual fuel use.

Proposal (cont.)

- Require new & modified sources to meet:
  - BACT
  - RfC
- Require existing sources to meet:
  - performance-based standard (i.e., presumptive BACT)
  - RfC

Sources Subject to the Standard

- Compressed-ignition internal combustion engines burning fuel oil:
  - new, modified and existing sources
  - stationary and portable sources
- Emergency electric generators meeting current definitions will continue to be exempt from permit & control requirements.

Effective Dates & Compliance Deadlines

- New and modified sources upon startup.
- Existing, no later than 3 years after rule revision.
- Ability to get extensions to compliance deadlines to deal with fuel or technology not being available will be included in the rule.

Why a Performance-Based Standard for Existing Sources Instead of BACT?

- Preferred option where similarities exist for:
  - emission source
  - control strategy
- Benefits
  - consistent requirements
  - reduced review time
  - regulatory certainty

Why a Performance-Based Standard for Existing Sources Instead of BACT? (cont.)

- Currently used in a number of situations to implement existing requirements:
  - gasoline dispensing facilities
  - asphalt plants
  - ethylene oxide sterilizers
  - petroleum storage tanks
  - combustion of wood, municipal and infectious waste

Why BACT for New Sources Instead of a Performance-Based Standard?

- BACT
  - considers the cost & availability of controls & energy as well as environmental impacts
  - can be more responsive during nation-wide transition to low sulfur fuels
  - staged or tiered requirements to address equity with existing sources
  - allows future determinations to consider advancements in engine design & control technology

Compliance Demonstration

- Will be based on operational characteristics (e.g.; hours, fuel use)
- Will have reduced monitoring, recordkeeping and reporting requirements compared to other sources.
- Will be set by permit, or in absence of permit by rule language.

Control Options for Diesel Particulate

- California's Air Resources Board, *"Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines"*:
  - describes catalyzed diesel particulate filters, fuel-borne catalysts, & electrically regenerated particulate filter control technology evaluations (Appendix 1)
  - lists approximately 150 engines certified by US EPA to be at or below 0.1 g/bHp-hr (Appendix 5)

Control Options for Diesel Particulate (cont.)

- Describes available PM control technologies that can achieve 80-90% reduction when used in conjunction with low sulfur fuel oil.
- Has limited information related to cost of controls.
- Website:

http://www.arb.ca.gov/diesel/documents/rmgFinal.pdf

NR 438 Reporting Thresholds

- Based on 50% RfC short stack threshold value of 444 pounds per year.
  - *A 0.1 g/bHP-hr engine operating at 100% load:*

    225 HP could operate 8760 hours/year w/o reporting

    500 HP could operate about 4000 hours/year w/o reporting

    1,000 HP could operate about 2000 hours/year w/o reporting

- Will not be a billable pollutant (already accounted for as particulate matter).

Recommendations

- Diesel exhaust particulate emissions should be listed in NR 445 as a probable carcinogen.
- Emissions from the combustion of diesel fuel should not be exempt from the control requirements in NR 445.
- Emissions from stationary & portable diesel-fueled engines should be regulated as a source category in NR 445.

Diesel (Electric) Generators - Site Specific Impacts

- Estimated site-specific impacts for 47 permitted electrical generators
- Over half have the potential to exceed a 1 in 10,000 risk
- About 200 generators totaling 370 megawatts have been permitted since 1999

Diesel (Power) Generators - Site Specific Impacts

- Limited source specific data on file, historically total facility PM impacts have been estimated.
- Current and future permit reviews will include an assessment of the impact from diesel generators.
- Have requested information from industry groups to help assess site specific impacts.
- Requires further evaluation.

Overview of Diesel Regulations

- Mobile sources are the major source of diesel emissions & make up about 95% of the diesel exhaust emission inventory
  - On-road mobile source contribution (58%)
  - Off-road mobile source contribution (37%)
  - Stationary & portable sources contribution (5%)
- EPA adopted standards for heavy-duty trucks & buses in Dec 2000
  - requires the use of low-sulfur fuel in 2006
  - sets stringent tail-pipe emission standards beginning in 2007
  - 90% reduction in diesel particulate emissions expected

Overview of Diesel Regulations (cont.)

- DNR to propose rules to “opt-in” to California’s Heavy Duty Diesel Engine Rule under s. 177 of the Clean Air Act.
  - would require 2005 model year vehicles to conform to CA emission limits
- Federal standard (RICE) for diesel & dual-fueled compressed ignition engines under s. 112 of the Clean Air Act not expected to:
  - set standards for existing sources
  - require reductions in diesel particulate matter

EPA's 1996 NATA National Scale Assessment

- National assessment of the public health risks associated with exposure to 32 CAA air toxics & diesel particulate matter.
- Purpose of assessment is to help identify pollutants of greatest potential concern.

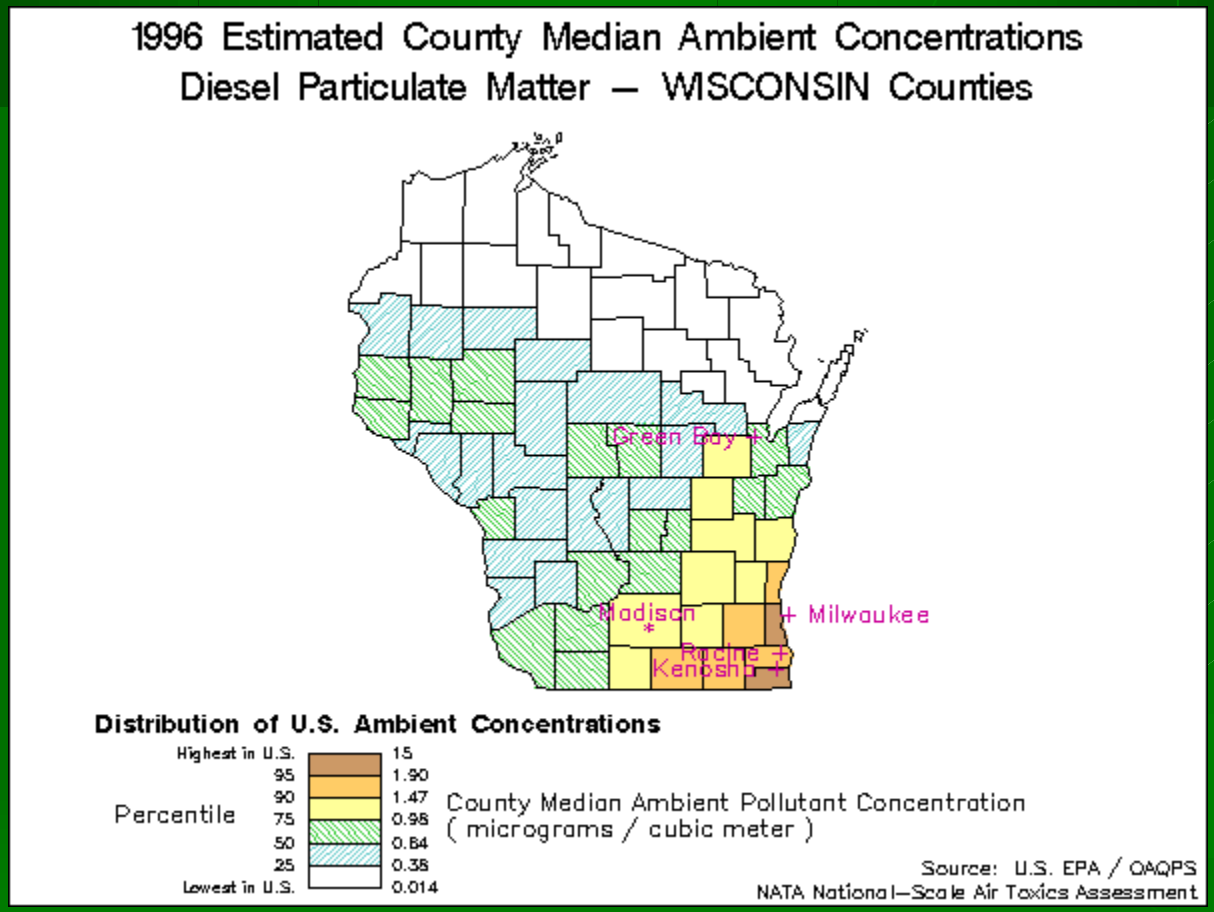
Diesel Exhaust Carcinogenicity

- Assessment of potential cancer risk for diesel exhaust guided by EPA's draft Health Assessment Document (HAD) and CASAC's comments. The conclusions:
  - Diesel exhaust is likely to be a human carcinogen at environmental exposure levels.
  - Ubiquity of exposure – particularly in highly populated areas.
  - Low end of occupational exposure overlaps with or within 10-fold of environmental exposures.
- While EPA did not believe that a potency factor could be derived at this time, CASAC concurred with EPA's attempt to present perspective on potential risk (i.e., a risk range was provided with careful description of limitations and assumptions)

Comparison to Other National-Scale Assessment Air Toxics

- In comparative terms, EPA concluded that diesel exhaust ranked with the other 11 substances that the assessment suggests pose the greater risk (of the 33 substances evaluated). This view is based on a qualitative analysis of:
  - The conclusions of the draft HAD as modified by CASAC (previous slide)
  - The national-scale assessment itself (which confirms the exposure conclusions in the HAD)
- The fact that the diesel hazard assessment is based on 22 epidemiology studies:
  - many of which show increased lung cancer associated with diesel exhaust
  - in contrast, most of the other HAPs evaluated for NATA have carcinogenic risk estimates based on animal studies

DRAFT 1996 EPA NATA
Diesel Particulate (On-Road Only)



NATA Diesel PM Results (ug/M3)

Statewide	Avg. = 1.35	95th% = 2.68
Urban Cnty	Avg. = 1.73	95th% = 2.57
Rural Cnty	Avg. = 0.60	95th% = 1.34
Milwaukee	Avg. = 2.59	95th% = 4.56
Waukesha	Avg. = 1.86	95th% = 2.55
Racine	Avg. = 1.78	95th% = 2.37
Dane	Avg. = 1.34	95th% = 1.69